NOTICE

All drawings located at the end of the document.

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Rocky Mountain Remediation Services, L.L.C.
protecting the environment

INTEROFFICE MEMORANDUM

DATE September 29, 1995

TO Distribution

FROM S L Garner, Accelerated Actions, Building 080, X9105 SLG

SUBJECT DRAFT PROPOSED ACTION MEMORANDUM AND SAMPLING ANALYSIS PLAN FOR TRENCHES T-3 AND T-4 - SLG-001-95

Please review the attached Draft Proposed Action Memorandum (PAM) and Sampling Analysis Plan (SAP) for the source removal action for Trenches T-3 and T-4 Please note that the PAM also includes the draft Permit Modification for the operation of the thermal desorption unit for treatment of the soils from these trenches A comment resolution meeting will be held on Monday, October 9th at 10 00 am in Building T893B, conference room number 67 Please bring your comments and questions to this meeting, or provide them to me prior to the meeting

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BZ-A-000377

DRAFT PROPOSED ACTION MEMORANDUM
FOR THE SOURCE REMOVAL AT TRENCHES T-3 AND T-4:
OPERABLE UNIT 2

September 29, 1995

Revision C
Document Control Number RF/ER-95-####.##

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DRAFT PROPOSED ACTION MEMORANDUM FOR THE SOURCE REMOVAL AT TRENCHES T-3 AND T-4: OPERABLE UNIT 2

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ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
IAG	Interagency Agreement
IHSS	Individual Hazardous Substance Site
MCLs	Maximum Concentration Levels
NAPL	Non-aqueous Phase Liquids
NEPA	National Environmental Policy Act
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PCE	Tetrachloroethene
PCOC	Potential Contaminant of Concern
PPRGs	Programmatic Preliminary Remediation Goals
RFA	Raocky Flats Alluvium
RFETS	Rocky Flats Environmental Technology Site
TCE	Trichloroethene
TDU	Thermal Desorption Unit
TPH	Total Petroleum Hydrocarbons
UHSU	Upper Hydrostratigraphic Unit
VOCs	Volatile Organic Compounds

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DRAFT PROPOSED ACTION MEMORANDUM FOR THE SOURCE REMOVAL AT TRENCHES T-3 AND T-4: OPERABLE UNIT 2

1.0 PURPOSE

This source removal action is proposed to remove the contaminated soils in Trenches T-3 and T-4 of Operable Unit (OU) 2, at the Rocky Flats Environmental Technology Site (RFETS), which are potentially contributing to the degradation of groundwater in the area Petroleum constituents and sludges contamintated with uranium and plutonium, were deposited in the two trenches for a period spanning three years, first using T-3 and continuing disposal in T-4, before the trenches were backfilled and their use discontinued Under this proposed action, the contaminated soils will be removed from the trenches and processed using thermal desorption At the conclusion of the project, the trench sites will be restored to a comparable undisturbed condition Further action may be necessary in the future at T-3 and T-4 to meet final remediation goals following the source removal The further action would be dependent on whether the final cleanup levels are achieved during the source removal The groundwater at T-3 and T-4, which was impacted by the contaminants disposed in the trenches, will be addressed as part of the Site groundwater management strategy

2.0 PROJECT DESCRIPTION

Information on construction, contamination history, geology and hydrogeology for the trench sites has been collected over many years and documented in various reports The most thorough presentation of this information for Trench T-3 is *Technical Memorandum No 4, Site Model for Hydrogeological/Contamination Distribution for Trench T-3* Information on Trench T-4 is taken from raw characterization data not published to date The location of both trenches is shown in Figure 2 1

2.1 Background

Based on historical aerial photographs and records, Trench T-3, also known as Individual Hazardous Substance Site (IHSS) 110, was used from approximately October 1964 through April 1966 Trench T-4, also known as IHSS 111 1, was used from approximately April 1966 through April 1967 Both trenches were used to dispose of sanitary sewage sludge contaminated with uranium and plutonium Flattened empty drums also contaminated with uranium and plutonium oils were disposed in the trenches Although the radiation content of the sewage sludge disposed in the East Trenches reportedly ranged from 382 picoCuries per gram (pCi/g) to 3,950 pCi/g, there are no reports of metallic nuclear materials deliberately buried in the trenches

Trench T-3 was constructed by bulldozing to a maximum depth of approximately 10 feet Dimensions of T-3 are approximately 20 feet by 134 feet as observed through ground-penetrating radar The trench appears to be deepest at the west end, with a gradually

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sloping access ramp to the east of the debris disposal Waste was stored in the western 50 to 100 feet of the trench and covered by approximately two feet of overburden Trench T-4 was constructed in a manner similar to T-3 The dimensions are approximately 20 feet by 125 feet Trench T-4 is approximately 10 feet deep

Both trenches are located in an area where surficial soils are contaminated with low levels of Americium-241 (Am-241) and Plutonium-239 (Pu-239) These contaminants were deposited by wind transport from the 903 Pad drum storage area The radiological contamination levels in the surficial soils are below PPRGs and are not detectable by hand held measuring devices

2.2 Hydrogeological Conditions

The uppermost geological unit in the vicinity of the trenches is the Rocky Flats Alluvium (RFA), an alluvial fan deposit approximately 15 feet thick beneath the trenches The RFA is underlain by the Arapaho Formation, which consists of claystone and sandstone This layer ranges in thickness from approximately 20 to 35 feet in the vicinity of the trenches During most of the year, the RFA beneath the trenches is dry, while the Arapaho Formation contains the upper hydrostratigraphic unit (UHSU) The normal depth to groundwater ranges from 20 to 30 feet below ground surface However, during periods of high groundwater, the RFA may become saturated beneath the trenches The depth to groundwater during these high groundwater periods ranges from 10 to 15 feet below ground surface The groundwater flow direction in the Arapaho Formation in the vicinity of the trenches is primarily to the north

2.3 Data Summary

Contamination exists at several locations within OU 2 and has been characterized using multiple methods including direct observation during drilling, soil samples analysis, groundwater analysis, and soil vapor surveys While the latter two methods contribute to the understanding of contamination near the trenches, they can be misleading due to the potential for migration of water and vapor from a contamination source beyond the investigation site For this reason, direct observation and soil analysis data are the primary data considered in analyzing the contamination in Trenches T-3 and T-4

2.3.1 Trench T-3 Contamination

Boreholes were drilled in the Trench T-3 area during November 1994 for the purpose of locating and characterizing subsurface contamination Other wells have been drilled in the vicinity of the trench during the past ten years The location of these boreholes and wells is shown in Figure 2 3 1 Groundwater samples were taken from up-gradient wells (24393 and 25093) and down-gradient wells (24193 and 24993) The results of these samples are summarized in Table 2 3 1 and

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TABLE 2.3.1
T-3 GROUNDWATER SAMPLING RESULTS SUMMARY

	Maximum Concentrations (µg/l)				
	Up-gradient Wells		Down-gradient Wells		Federal
Contaminant	24393	25093	24193	24993	MCLs
Carbon tetrachloride (CCl_4)	2600	1500	5200	4100	5
Tetrachloroethene (PCE)	1600	780	1600	1600	5
Trichloroethene (TCE)	91	64	110	110	5
Toluene	20	10	40	30	1000
Total Xylenes	30	15	60	45	10,000

indicate a definite increase in volatile organic compounds (VOCs) in the groundwater after passing through the trench

Detailed soil sampling data is presented in Table 2 3 2 The contaminants of concern are volatile organic compounds (VOCs) Although radioactive waste was reportedly disposed in the trench, the activity levels in the soils are below programmatic preliminary remediation goals (PPRGs)

Non-aqueous phase liquids (NAPL) were encountered in several locations in T-3 Samples from all boreholes where NAPL was encountered during drilling showed indications of NAPL at depths above or consistent with the bottom of the trench, six to ten feet below the ground surface Perched liquid was encountered in a large void space between two and five feet below the surface Evidence of crushed drums was found in several locations during drilling in Trench T-3

This data indicates that crushed drums were loaded into portions of the trench fairly densely, and stacked on top of each other, forming subsurface caverns Soil was either layered in the trench with the drums, or has sifted between the drums from the overburden Relatively large amounts of liquid waste, principally diesel fuel, gasoline, and solvent-contaminated oils were disposed in the trench This fluid has settled into disconnected pools in caverns among the drums and in the pore space of the soil Dark, viscous layers found above the pools are due to biodegradation of the organic wastes in contact with oxygen A layer of organic waste has also settled to the bottom of the trench in an asphalt-like layer several feet thick in places

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TABLE 2.3.2
ANALYTES DETECTED IN SUBSURFACE SOILS AT TRENCH T-3

Analyte	Background Mean plus 2 Standard Deviations[6]	Number of Samples	Number of Detections[5]	Percent Detections	Concentration or Activity Range[1]	Mean Concentration or Activity[2 7]
Volatile Organic Compounds (µg/kg)						
1,1,1-Trichloroethane	NA	57	9	15.8	6-27,000$^{(J)}$	8,046
1,1-Dichloroethene	NA	57	1	1.8	9	9
1,2-Dichloroethane	NA	57	2	3.5	6$^{(J)}$-14$^{(J)}$	10
1,2-Dichloroethene	NA	45	1	2.2	1$^{(J)}$	1
2-Butanone	NA	53	7	13.2	40$^{(J)}$-88	60
Acetone	NA	57	15	26.3	36-86,000	10,233
Carbon tetrachloride	NA	57	19	33.3	3$^{(J)}$-700,000	62,964
Chloroform	NA	57	17	29.8	1$^{(J)}$-8,800	534
Ethylbenzene	NA	57	1	1.8	2$^{(J)}$	2
Methylene chloride	NA	57	21	36.8	4$^{(J)}$-55,000$^{(B)}$-RV	5,792
Tetrachloroethene	NA	57	28	49.1	1$^{(J)}$-13,000,000$^{(D)}$	543,280
Toluene	NA	57	41	71.9	5$^{(J)}$-7,600$^{(J)}$	484
Trichloroethene	NA	57	7	12.3	1$^{(J)}$-120,000	18,302

(1) In this column, the J qualifier represents estimated results, the D qualifier represents dilution results, the B qualifier for organics indicates analyte was detected in blank sample, and the B qualifier for metals represents estimated result
(2) The calculation for the mean concentration includes all J, D, and B qualified data
(3) For metals and radionuclides, only potential chemicals of concern (PCOCs) were reviewed and presented in this table
(4) Radionuclide activities less than or equal to zero are considered to be non-detections
(5) Radionuclide and metal results less than the background mean plus two standard deviations are considered to be non-detections
(6) Background concentrations do not exist and are not applicable for organic compounds
(7) Mean of detections only, actual mean values for the trench would be substantially lower do to nondetects

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TABLE 2.3.2 (Continued)
ANALYTES DETECTED IN SUBSURFACE SOILS AT TRENCH T-3

Analyte	Background Mean plus 2 Standard Deviations[6]	Number of Samples	Number of Detections[5]	Percent Detections	Concentration or Activity Range[1]	Mean Concentration or Activity[2 7]
Semivolatile Organic Compounds (μg/kg)[6]						
2-Methylnaphthalene	NA	19	1	5 3	8,100[D]	8,100
2-Methylphenol	NA	19	1	5 3	450	450
4-Methylphenol	NA	19	1	5 3	2,900	2,900
Bis(2-ethylhexyl)phthalate	NA	18	18	100 0	51[J]-5,500	523
Di-n-butyl phthalate	NA	19	1	5 3	1,300	1,300
Hexachlorobutadiene	NA	19	1	5 3	170[J]	170
Hexachloroethane	NA	19	2	10 5	370-1,100	735
Naphthalene	NA	19	1	5 3	2,000	2,000
Phenanthrene	NA	19	1	5 3	2,700	2,700
Pesticides/PCBs (μg/kg)						
Aroclor-1254	NA	19	1	5 3	6,900[J]	6,900

(1) In this column, the J qualifier represents estimated results, the D qualifier represents dilution results, the B qualifier for organics indicates analyte was detected in blank sample, and the B qualifier for metals represents estimated result
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TABLE 2.3.2 (Continued)
ANALYTES DETECTED IN SUBSURFACE SOILS AT TRENCH T-3

Analyte	Background Mean plus 2 Standard Deviations	Number of Samples	Number of Detections(5)	Percent Detections	Concentration or Activity Range(1)	Mean Concentration or Activity(2 7)
PCOC Metals above background (mg/kg)(3)						
Arsenic	13 2	23	4	17 4	15-26	10 75
Barium	289	23	1	4 3	413	413
Cadmium	1 7	23	6	26 1	2 1-6 2	3 48
Calcium	39,393 6	23	1	4 3	67,300	67,300
Lead	24 9	23	1	4 3	86 4	86 4
Manganese	901 6	23	2	8 7	1,440(B)-3,090	2,265
Silver	24 6	23	1	4 3	96 5	96 5

(1) In this column, the J qualifier represents estimated results, the D qualifier represents dilution results, the B qualifier for organics indicates analyte was detected in blank sample, and the B qualifier for metals represents estimated result
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(4) Radionuclide activities less than or equal to zero are considered to be non-detections
(5) Radionuclide and metal results less than the background mean plus two standard deviations are considered to be non-detections
(6) Background concentrations do not exist and are not applicable for organic compounds
(7) Mean of detections only, actual mean values for the trench would be substantially lower do to nondetects

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TABLE 2.3.2 (Continued)
ANALYTES DETECTED IN SUBSURFACE SOILS AT TRENCH T-3

Analyte	Background Mean plus 2 Standard Deviations	Number of Samples	Number of Detections(5)	Percent Detections	Concentration or Activity Range(1)	Mean Concentration or Activity(2 7)
PCOC Radionuclides above background (pCi/g)(3)(4)						
Americium-241	0 012	19	8	42 1	0 01523(J)-0 5983	0 124
Gross beta	36 839	19	1	5 3	56 74	56 74
Plutonium-239/240	0 018	19	13	68 4	0 02-3 12	0 31
Radium-226	1 208	5	2	40 0	1 226-1 275	1 251
Strontium-89/90	0 747	19	3	15 8	0 8-1 1	0 97
Tritium (pCi/l)	395 211	19	1	5 3	400	400
Uranium-233/234	2 643	9	1	11 1	14 35	14 35
Uranium-235	0 114	9	1	11 1	0 7509	0 7509
Uranium-238	1 485	19	3	15 8	1 611-26 37	9 93

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(4) Radionuclide activities less than or equal to zero are considered to be non-detections
(5) Radionuclide and metal results less than the background mean plus two standard deviations are considered to be non-detections
(6) Background concentrations do not exist and are not applicable for organic compounds
(7) Mean of detections only, actual mean values for the trench would be substantially lower do to nondetects

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2.3.2 Trench T-4 Contamination

Boreholes and wells have been drilled in the Trench T-4 area for the purpose of locating and characterizing subsurface contamination over the past eight years The location of these boreholes and wells is shown in Figure 2 3 2 Groundwater samples were taken from an up-gradient well (3091) and down-gradient well (3687) The results of these samples are summarized in Table 2 3 3 and indicate a definite increase in volatile organic compounds (VOCs) in the groundwater after passing through the trench

Detailed soil sampling data is presented in Table 2 3 4 The contaminants of concern are volatile organic compounds (VOCs) Although radioactive waste was reportedly disposed in the trench, the activity levels in the soils are below programmatic preliminary remediation goals (PPRGs)

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TABLE 2.3.3
T-4 GROUNDWATER SAMPLING RESULTS SUMMARY

Contaminant	Maximum Concentrations (µg/l) Up-gradient Well 3091	Down-gradient Well 3687	Federal MCLs
Carbon tetrachloride (CCl_4)	450	1600	5
Tetrachloroethene (PCE)	39	1100	5
Trichloroethene (TCE)	51	120,000	5
Toluene	8	3100	1000
Total Xylenes	nondetect	1200	10,000

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TABLE 2.3.4
ANALYTES DETECTED IN SUBSURFACE SOILS AT TRENCH T-4

Analyte	Background Mean plus 2 Standard Deviations[6]	Number of Samples	Number of Detections[5]	Percent Detections	Concentration or Activity Range[1]	Mean Concentration or Activity[2,7]
Volatile Organic Compounds (µg/kg)						
1,1,1-Trichloroethane	NA	44	8	18.2	2[J]-2300[E]	490.5
1,1-Dichloroethene	NA	41	5	12.2	2[J]-1044	210
1,2-Dichloroethene	NA	39	3	7.7	0.536[J]-2[J]	1.51
2-Butanone	NA	40	15	37.5	2[J]-63	23.7
Acetone	NA	49	26	53.1	6[J]-120,000	5500
Carbon tetrachloride	NA	37	9	24.3	3[J]-540[D,J]	135.4
Chloroform	NA	66	38	57.6	1[J]-870[D,J]	59.63
Ethylbenzene	NA	31	6	19.4	12-870[D,J]	195
Methylene chloride	NA	45	30	66.7	1[J]-8200[B,J]	423
Tetrachloroethene	NA	61	37	60.7	1[J]-37,000	3408
Toluene	NA	50	43	86.0	1[J]-670[J]	62.53
Trichloroethene	NA	89	63	70.8	1[J]-680,000	11,896

(1) In this column, the J qualifier represents estimated results, the D qualifier represents dilution results, the B qualifier for organics indicates analyte was detected in blank sample, and the B qualifier for metals represents estimated result
(2) The calculation for the mean concentration includes all J, D, and B qualified data
(3) For metals and radionuclides, only potential chemicals of concern (PCOCs) were reviewed and presented in this table
(4) Radionuclide activities less than or equal to zero are considered to be non-detections
(5) Radionuclide and metal results less than the background mean plus two standard deviations are considered to be non-detections
(6) Background concentrations do not exist and are not applicable for organic compounds
(7) Mean of detections only, actual mean values for the trench would be substantially lower do to nondetects

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TABLE 2.3.4 (Continued)
ANALYTES DETECTED IN SUBSURFACE SOILS AT TRENCH T-4

Analyte	Background Mean plus 2 Standard Deviations(6)	Number of Samples	Number of Detections(5)	Percent Detections	Concentration or Activity Range(1)	Mean Concentration or Activity(2 7)
Semivolatile Organic Compounds (μg/kg)(6)						
2-Methylnaphthalene	NA	13	4	30 8	51-290(J)	123
Bis(2-ethylhexyl)phthalate	NA	32	27	84 4	38(J)-1500(B)	391
Di-n-butyl phthalate	NA	12	1	8 3	52(J)	52
Naphthalene	NA	12	3	25 0	52(J)-150(J)	117
Phenanthrene	NA	14	5	35 7	130(J)-1100	680

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(6) Background concentrations do not exist and are not applicable for organic compounds
(7) Mean of detections only, actual mean values for the trench would be substantially lower do to nondetects

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TABLE 2.3.4 (Continued)
ANALYTES DETECTED IN SUBSURFACE SOILS AT TRENCH T-4

Analyte	Background Mean plus 2 Standard Deviations	Number of Samples	Number of Detections(5)	Percent Detections	Concentration or Activity Range(1)	Mean Concentration or Activity(2 7)
PCOC Metals above background (mg/kg)(3)						
Arsenic	13 2	89	44	49 4	2 1(B)-11 5	5 89
Barium	289	82	41	50 0	15 6(B)-153	64 02
Cadmium	1 7	40	7	17 5	0 34(B)-10 5	1 996
Calcium	39,393 6	92	46	50 0	796-50,700	5,080
Lead	24 9	92	46	50 0	2 7-59 5	8 33
Manganese	901 6	135	89	65 9	14 6-1130	235
Silver	24 6	48	15	31 3	0 91(B)-68 5	7 36

(1) In this column, the J qualifier represents estimated results, the D qualifier represents dilution results, the B qualifier for organics indicates analyte was detected in blank sample, and the B qualifier for metals represents estimated result
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(4) Radionuclide activities less than or equal to zero are considered to be non-detections
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(6) Background concentrations do not exist and are not applicable for organic compounds
(7) Mean of detections only, actual mean values for the trench would be substantially lower do to nondetects

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TABLE 2.3.4 (Continued)
ANALYTES DETECTED IN SUBSURFACE SOILS AT TRENCH T-4

Analyte	Background Mean plus 2 Standard Deviations	Number of Samples	Number of Detections[5]	Percent Detections	Concentration or Activity Range[1]	Mean Concentration or Activity[2 7]
PCOC Radionuclides above background (pCi/g)[3][4]						
Americium-241	0 012	46	42	91 3	0 002726[J]-12 99	0 516
Gross beta	36 839	50	50	100 0	6 044-427 8	35 041
Plutonium-239/240	0 018	55	49	89 1	0 001431[J]-20 78	1 086
Radium-226	1 208	35	35	100 0	0 1714[J]-0 9491	0 516
Strontium-89/90	0 747	31	29	93 5	0 001879[J]-1 08	0 157
Tritium (pCi/l)	395 211	122	94	77 0	0 4851-500	123 7
Uranium-233/234	2 643	50	50	100 0	0 4851-170 4	8 083
Uranium-235	0 114	50	46	92 0	0 008315[J]-11 5	0 450
Uranium-238	1 485	50	50	100 0	0 06-288 4	9 924

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(2) The calculation for the mean concentration includes all J, D, and B qualified data
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(6) Background concentrations do not exist and are not applicable for organic compounds
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3.0 PROJECT APPROACH

The proposed action entails excavating volatile organic contaminated soil and material from Trenches T-3 and T-4 and processing it using thermal desorption The project will be a source removal within the dimensions of the trenches, eliminating the contamination within the trenches and preventing further degradation of the surrounding soils and groundwater The trench boundaries will be staked prior to excavation, and only the material within the trench boundaries will be excavated If visible staining remains after excavarting the boundaries of the trenches, further excavation to remove the stains will be done

3.1 Proposed Action Objectives

The Trench T-3 and T-4 remediation will remove contaminated material identified in association with the trenches, preventing any further groundwater contamination from those sources The subsurface soils within the trenches have substantially higher concentrations of volatile organics than the surrounding areas, and groundwater sampling from up-gradient and down-gradient of the trenches indicate an increase in contamination as the water passes through the trenches

3.2 Proposed Action

The proposed action for Trenches T-3 and T-4 involves excavating approximately 5,000 cubic yards of material from the trenches After a radiological field screening, a track-mounted backhoe will be used to excavate the soil from the trenches The backhoe will be equipped with an opposable thumb, or clamshell, on the bucket for grasping and manipulating drum-sized debris It is anticipated that the rate of excavation will exceed the rate of thermal desorption processing Therefore, the contaminated excavated soil will be placed in roll-off containers next to the trench site, then transported to the thermal desorption unit as needed to keep the thermal desorption process continuous, as practicable

A sturdy shallow tub shall be set up adjacent to the excavation for the purpose of staging debris removed from the trenches Soil will be removed from the debris and collected in the tub Additionally, wash water used for decontaminating debris unable to be sent to the TDU can be collected in the tub

Throughout the excavation and reclamation activities, dust minimization techniques, such as water sprays and/or dust suppressants, will be used to minimize suspension of particulates Earth moving operations will not be conducted during periods of high winds The RFETS Environmental Restoration Field Operations Procedure for Air Monitoring and Dust Control provides guidance for monitoring of wind speed and work stoppage during high winds

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Dewatering of the trenches should not be necessary unless the groundwater is unusually high If dewatering of the trench is necessary, a field sump will be created in the trenches and pumped out with a portable submersible pump into a temporary storage container(s) The fluids will be treated by one or more of the following facilities Building 891, the OU 2 Field Treatability Unit, the planned Site-wide Consolidated Water Treatment Facility, or Building 374 Following treatment, the water will be sampled and released in accordance with respective discharge criteria Alternatively, the water could be taken off-site for treatment and disposal if necessary Any free product encountered will be mixed with the soils to be processed in the TDU

After excavation and thermal desorption treatment, samples will be collected and analyzed for the VOC's contaminants of concern to establish the post-action condition of the trenches and to verify compliance with Programmatic Preliminary Remediation Goals (PPRGs) or other appropriate action levels in the treated material Since the existing characterization data indicates that metals and radiological contaminants are not a concern in the trenches, no further soil sampling will be done for those contaminants Following verification that the thermal desorption has removed the VOC contamination, the trenches will be backfilled with treated soils and the area will be revegetated to return the trenches to a comparable undisturbed condition

The thermal desorption unit (TDU) will be loaded from the roll-off containers as the process demands and operated continuously, as practicable. Any material, such as crushed drums, that can not be treated or decontaminated will be placed in containers for disposal The thermal desorption process will eliminate the volatile and semi-volatile organic constituents from the soil The radioactive contaminants are below PPRGs and will be replaced with the soil Following treatment, the soil will be loaded into a clean roll-off container and sampled to determine the completeness of the treatment

At the completion of remediation efforts, all equipment will be decontaminated Typical decontamination methods would include pressure washing of both the excavation equipment and TDU Any filters from the off-gas treatment process or other material incapable of being decontaminated will be disposed of by appropriate procedures

3.3 Worker Health and Safety

Due to the contaminants present in the trenches, this project falls under the scope of the Occupational Safety and Health Administration (OSHA) construction standard Under this standard, a site-specific health and safety plan will be developed which addresses the safety and health hazards of each phase of site operations and specifies the requirements and procedures for employee protection Additionally, a hazard analysis will be developed which specifies the hazards to which employees may be exposed during the conduct of each phase of the project as well as the appropriate control measures to be used These documents will be integrated wherever possible

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This project involves potential worker exposures to physical, chemical, and radiological hazards The physical hazards include those associated with excavation activities, use of heavy equipment, and work on uneven surfaces As planned, workers will not need to enter the trenches, thus eliminating hazards associated with work in excavations and confined spaces However, if the field conditions vary from the planned approach, an activity analysis will be prepared for the existing circumstances and work will proceed according to the appropriate control measures Employee exposure to noise and heat stress will be evaluated Appropriate personal protective equipment will be worn throughout the project

Airborne concentrations of VOCs are expected to be below respective employee limits However, due to the number of VOCs, the combined concentration will also be evaluated against the exposure limits for chemical mixtures Routine VOC monitoring will be conducted for any employees who must work near the contaminated soil Those employees will begin work in level C respiratory protection Appropriate skin protection will also be worn Following employee exposure evaluation, the Site Safety Officer may downgrade personal protective equipment requirements accordingly

Monitoring for radiological contamination will be conducted throughout the project If specified levels are exceeded, the area will be posted, and work will continue under a Radiological Work Permit

3.4 Waste Management

Thermal desorption is an ex-situ process in which a contaminated soil or sludge is heated to a temperature sufficient to volatilize the organic compounds of concern Depending on the specific thermal desorption vendor selected, the treatment unit heats the soils to a temperature range between 200 and 1000 degrees Fahrenheit The gaseous products are removed by a purge gas collection system and treated in a downstream off-gas treatment system No incineration or destruction of VOCs occurs in the TDU Again, depending on the manufacturer, the off-gases may be captured and cooled in a condenser and polished through an activated carbon filter and/or high efficiency particulate air filter Prior to being fed into the TDU, oversized material, such as large cobbles and debris, will be removed from the soil feedstock The processed soils from the TDU will be returned to the trenches If soil is disposed off-site or at an on-site facility, clean fill will be used to backfill the excavated area

Based on historical information about Trench T-3 and T-4, the sludge deposited in the trenches contained radiological contamination However, data collected during the remedial investigation indicate that the levels of radiological contamination are below the risk-based PPRGs for subsurface soils If radiological contamination is found in the soils in excess of the PPRGs, the soils will be disposed of appropriately

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Any ancillary wastes generated as part of this proposed action, such as personal protective equipment, will be characterized based on process knowledge and radiological screening It will then be managed, recycled, treated, and or disposed according to RFETS policies and procedures and in accordance with Federal, State, and local laws and regulations

Based on historical records, listed wastes [insert codes here when found] were disposed in the trenches Additionally, characterization samples indicate the potential in a small percentage of the samples to be a characteristic hazardous waste Therefore, the soil excavated from the trenches will be managed as a hazardous waste under the "contained-in" rule That is, the soil, which is the environmental media contaminated with a hazardous waste, will no longer be managed as a hazardous waste if the hazardous constituents have been completely removed by treatment Following processing of the soils through the TDU, the soils will be placed in clean roll off containers Each container will be sampled as a batch for verification that the hazardous constituents have been removed If the soils are free of hazardous elements, the soil will be returned to the trenches Otherwise, depending on the contaminants found remaining in the media, the soil will be re-processed at higher temperatures or disposed of in an appropriate manner The condensate collected from the thermal desorption process will contain the hazardous constituents removed from the soil during processing This liquid will continue to be managed as a hazardous waste, and will be disposed of accordingly

4.0 ENVIRONMENTAL IMPACTS

The National Environmental Policy Act (NEPA) requires that actions conducted at RFETS be evaluated for potential impacts to the environment Impacts to the natural environment resulting from the proposed action will be minimal The impacts are not expected to result in any adverse impacts to wetlands, flood plains, threatened or endangered species or their habitats, and historic or cultural resources There will be minor releases of air pollutants from heavy equipment operation during excavation as well as minor increases in particulates (dust) associated with the operation of loading, unloading, and transferring containers Any airborne particulates and contaminants resulting from the excavation activities will be controlled using best management practices, including water sprays and covering Once the removal of the contaminant source from the trenches is complete and the processed material is replaced in the trenches, the sites will be returned to natural grade in the area and reseeded with appropriate vegetation

5.0 COMPLIANCE WITH ARARS

In accordance with the Interagency Agreement (IAG), an objective of accelerated actions at RFETS is the identification and compliance, to the extent practicable, with Federal and State Applicable or Relevant and Appropriate Requirements (ARARs) ARARs relating to this proposed action are identified in this section and summarized in Table 5 1

There are no chemical-specific ARARs or location-specific ARARs for this proposed action The Colorado Air Pollution Prevention and Control Act standards for emissions (5 CCR 1001-3,

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5 CCR 1001-9) have been identified as action-specific ARARs Based on characterization data available from the trench vicinity, the anticipated air emissions will be calculated to determine what type of control measures will be needed to ensure compliance with the standards This analysis, when completed, will be provided to the Colorado Department of Public Health and the Environment prior to the start of operations

Additionally, the National Emission Standards for Hazardous Air Pollutants for the radionuclide emissions (40 CFR 61, Subpart H) have been identified as an action-specific ARAR The effective dose equivalent will be calculated for those emissions anticipated from the operations associated with excavation and the thermal desorption process

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TABLE 5.1 ARARs for the Proposed Action of Trench T-3 and T-4

Action	Requirement	Prerequisite	Citation	ARAR	Comment
Air Quality	Compliance with air emissions	Prevention of exceeding emissions for particulates and VOCs	5 CCR 1001-3 5 CCR 1001-9	Applicable	None
	Compliance with air emissions	Calculations to determine radionuclide emissions do not exceed 0 1 mrem/yr	40 CFR 61, Subpart H	Applicable	None
Radiation Protection	Compliance with radiation exposure levels	Ensure radiation exposure resulting from removal action does not exceed effective equivalent dose for 100 mrem/yr	DOE Order 5400-5, Chap II 1a, 1b, and Chap III	TBC	None
Hazardous Waste	Compliance with container management	Manage container condition, compatibility of waste, inspections, containment, and closure	6 CCR 1007-3 40 CFR 264 171, 172, 173, 174, 175, 178	Applicable	None
Process Air Emissions	Compliance with air emissions standards for process vents and equipment leaks	Operate treatment systems that contact hazardous wastes with organic concentrations of at least 10% by weight	6 CCR 1007-3 40 CFR 264 Subpart AA and Subpart BB	Relevant and Appropriate	None

6.0 IMPLEMENTATION SCHEDULE

The removal of contaminated soils in Trenches T-3 and T-4 is scheduled to commence in the first fiscal quarter of 1996 with documentation preparation Field activities are scheduled to begin in the second fiscal quarter of 1996 with completion of the removal of contaminated soils from Trench T-4 in the last fiscal quarter of 1996 Data reduction and reporting efforts are scheduled to be completed the first fiscal quarter of 1997 These dates are projected from the work package Any delays, scope or budget changes may affect these dates

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APPENDICES

Appendix A Thermal Desorption Operation Permit Monification

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APPENDIX A
DRAFT
MODIFICATION OF COLORADO HAZARDOUS WASTE CORRECTIVE ACTION SECTION OF THE OPERATING PERMIT FOR ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

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ACRONYMS

APEN	Air Pollution Emissions Notice
CCR	Colorado Code of Regulations
CFR	Code of Federal Regulations
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
EPA	Environmental Protection Agency
HEPA	High efficiency particulate air
Hg	Mercury
HSP	Health and Safety plan
IAG	Interagency Agreement
IHSS	Individual Hazardous Substance Site
PAM	Proposed Action Memorandum
PCE	Tetrachloroethene (perchloroethylene)
RCRA	Resource Conservation and Recovery Act
RFETS	Rocky Flats Environmental Technology Site
TCE	Trichloroethene (trichloroethylene)
TCLP	Toxicity Characteristic Leaching Procedure
TD	Thermal desorption
VOCs	Volatile organic compounds

DRAFT
MODIFICATION OF COLORADO HAZARDOUS WASTE CORRECTIVE ACTION SECTION OF THE OPERATING PERMIT FOR ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

A.1 INTRODUCTION

This draft modification of the corrective action section of the operating permit have been prepared to enhance available information regarding storage and treatment of contaminated soils resulting from expedited cleanup activities at Individual Hazardous Substance Sites (IHSS) 110 and 111 1, Operable Unit 2, Rocky Flats Environmental Technology Site (RFETS) These IHSSs were used as a disposal site for sanitary sewer sludge from approximately 1964-1966 A draft PAM (Document Control Number RF/ER-95-0097 UN) under the Rocky Flats Interagency Agreement (IAG) has been prepared which focuses on source removal at IHSSs 110 and 111 1 This appendix addresses the proposed processing of contaminated soils using Thermal Desorption (TD) technology and was developed to complement the source removal PAM This document provides specific information on contaminated soils storage, processing, equipment decontamination, health and safety, and the use of TD as a significant waste minimization opportunity The container storage section described below is included to formalize requirements if the soil is to be in storage for greater than 90 days

The container storage areas and the thermal desorption treatment unit discussed in this document are considered Temporary Units under 6 CCR 1007-3, 264 553 As identified under this regulation, the Temporary Unit classification applies due to the short time frame for operation of the storage and thermal desorption unit, the mobile nature of the equipment, and the small volume of soil to be treated The activities described under this permit modification are expected to be conducted in the spring and summer of 1996 However, due to factors such as equipment and funding availability, this permit modification is to be in place until December 31, 1996 This corrective action permit modification outlines the approach that will be taken and the applicable requirements for the removal of organic contaminants from soil at IHSSs 110 and 111 1 These organic contaminants are Comprehensive Environmental Response Compensation and Liability Act (CERCLA) hazardous substances and Resource Conservation and Recovery Act (RCRA) hazardous waste constituents which are contained in an environmental media (soil) Except where specifically cross-referenced, other sections of the operating permit are inapplicable to this action

A.2 TREATMENT AND STORAGE UNITS

A.2.1 Storage

Contaminated soil excavated from IHSSs 110 and 111 1 will be placed into roll-off containers prior to processing at the mobile thermal desorption unit The contaminated soil will be managed according to the requirements listed below These requirements

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generally govern the condition and compatibility of containers with waste materials and the management and inspection of the containers After being filled, the roll-off containers will be moved to an area designated for processing by the mobile thermal desorption unit Following processing and evaluation of confirmation samples, the clean soil is expected to be returned to IHSSs 110 and 111 1 for final disposition

The specific requirements that shall be followed to ensure proper handling of the contaminated soil while in storage are

- All containers holding contaminated soil shall be in good condition (6 CCR 1007-3, 264 171)
- All containers holding contaminated soil will be made of, or lined with, materials that will not react with the contained material (6 CCR 1007-3, 264 172)
- All containers holding contaminated soil will remain closed during storage except when it is necessary to add or remove contaminated soil Canvas or plastic tarpaulins may be used as a cover device to close the roll-off containers The roll-offs will be handled in such a way as to preclude leakage or rupture at any time (6 CCR 1007-3, 264 173)
- All containers holding contaminated soil shall be inspected weekly in the period after excavation and before processing The focus of these inspections shall be to look for leaks and for deterioration caused by corrosion or other factors A log book documenting these inspections and all deficiencies and corrective actions shall be kept (6 CCR 1007-3, 264 174)
- Roll-off containers used for the storage of contaminated soil will be manufactured such that the base of the container will be elevated This elevation will protect the contaminated soils within the roll-off containers from contact with precipitation caused by runoff on the land surface (6 CCR 1007-3, 264 175(c)(2)) and also allows for visual inspection for leaks

Additional requirements will be placed on liquid organic contaminants recovered from the thermal desorption units condenser The requirements that shall be followed to ensure proper handling of the condensate while in storage are

- A temporary secondary containment system will be established which protects against release of recovered liquid organic contaminants into the environment The condensing unit on the thermal desorber will be considered a container Secondary containment will be established around this container which allows for complete capture and retainment of the entire condenser contents, if the condenser were to be breached Secondary containment will also be established for 55-gallon drums or other similar containers which contain recovered organic waste removed from the thermal desorption unit's condenser This secondary containment will be designed and operated to contain the contents of one 55-gallon drum or a minimum of 10% of the liquid waste volume stored within the secondary containment, (whichever is greater) This containment will be free of cracks or

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gaps and will be sufficiently impervious to contain leaks The containers within the secondary containment system will be elevated by pallets or similar devices to prevent contact with accumulated liquids Run-on into the secondary containment system will be prevented by the walls of the system Any spilled or accumulated liquids (including precipitation) will be removed within 24 hours after detection (6 CCR 1007-3, 264 175) Spills of organic condensate will invoke the Contingency Plan contained in Part VI of the RFETS Part B Permit

The staging area for roll-offs containing contaminated soil and 55 gallon drums of organic waste will have signs posted and labels placed in conspicuous locations, indicating appropriate dangers

A.2.2 Treatment

A low-temperature thermal desorption system will be used to remove volatile organic compounds (VOCs) in a non-destructive manner from soils excavated from IHSSs 110 and 111 1 The soils will be processed by passing air through the contaminated soil to volatilize or "strip" the VOCs from the soil into the vapor phase In addition to the air sweep, heat and vacuum will be applied to the soils to enhance the VOC-stripping process The vapor-phase contaminants will then be recovered by condensation and activated carbon adsorption

Additional description of the thermal desorption system components, operation, and secondary waste streams that will be generated is presented below The operating data (i e , batch size, temperature, etc) presented in Subsection 2 2 1 are typical of batch-operated, low-temperature thermal desorber systems but may not describe the exact unit contracted for this task A continuous processing unit capable of processing larger volumes may be utilized

A.2.2.1 System Description and Operation

Figure 1 presents a process flow sheet of the thermal desorption process VOC-contaminated soil is loaded into the soil treatment units Due to the high moisture content levels that may be encountered in IHSSs 110 and 111 1, it is anticipated that the Thermal Desorption unit will not be loaded to full capacity to more efficiently strip the soil Feedstock soil will be transferred from covered storage containers (i e , roll-offs) to the soil treatment units with a backhoe, Bobcat, or other type of heavy machinery The soil treatment units are constructed of heavy structural steel and are capable of supporting the weight of a backhoe or other large machinery The structural steel construction makes the units suitable for treating soils containing hazardous waste Prior to unloading, a storage container (e g , roll-off) will be located as close to the desorber as possible to minimize the distance the soil will have to be moved by the heavy machinery If free liquids

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are encountered during excavation activities, additional site preparation will take place to prevent any spill of free liquids contaminating clean areas

Soil clumps to be loaded into the treatment units that are larger than the capacity of the unit will be broken into smaller pieces Low-temperature batch desorption is typically capable of effectively removing VOCs from soil clumps up to approximately eight inches in diameter

The thermal desorber may be equipped with multiple soil treatment units for maximum throughput Processing capability of a typical four-unit system is approximately 8 tons per hour (5 cubic yards/hour) Once loaded, the soil treatment units are closed and an air sweep is induced across the soil beds by a fan unit The air sweep creates a slight vacuum (i e , 700 - 750 mm Hg) in the soil treatment units which serves to enhance the VOC stripping rate Stripping is also enhanced by the indirect heating of the soil Heat is generated by burning propane (or natural gas) and passing the hot combustion gases through metal tubes located above the soil in the treatment units Heat from the combustion gases is transferred through the tube walls to the air sweep and soil All three heat transfer mechanisms are present conduction, convection, and radiation The energy input rate of the thermal desorber is approximately 1 5 million BTU per hour This heating rate is achieved by burning approximately 28 gallons of liquid propane fuel per hour Soil operating temperatures range from approximately 150 to 300 degrees Fahrenheit in a typical thermal desorber

The VOC contaminants contained in the air sweep/offgas exiting the soil treatment units are removed prior to discharge First, a high efficiency particulate air (HEPA) filter is used to remove any soil particulates that may be entrained in the offgas The offgas is then cooled by a condenser to recover the majority of water and VOC contaminants as liquids Because the condenser produces liquid wastes, secondary containment will be provided around the condenser unit No chemicals are added as part of the desorption process, thus, no chemical incompatibilities are anticipated The condenser is the first unit that concentrates the desorbed contaminants As noted above, both the VOCs and water are condensed simultaneously Following the condensing process, the offgas is polished with vapor-phase activated carbon to recover residual VOCs prior to discharge

The thermal desorption unit will be operated in accordance with the thermal treatment standards found in 6 CCR 1007-3, Subpart P of Section 265 Additionally, the air emission standards for process vents and equipment leaks defined in 6 CCR 1007-3, Subparts AA and BB of Section 264, will be followed as appropriate The vendor supplying and operating the thermal desorption unit may demonstrate to the Colorado Department of Public Health and Environment that alternative temporary unit standards are appropriate These alternative standards would then be considered part of this permit modification

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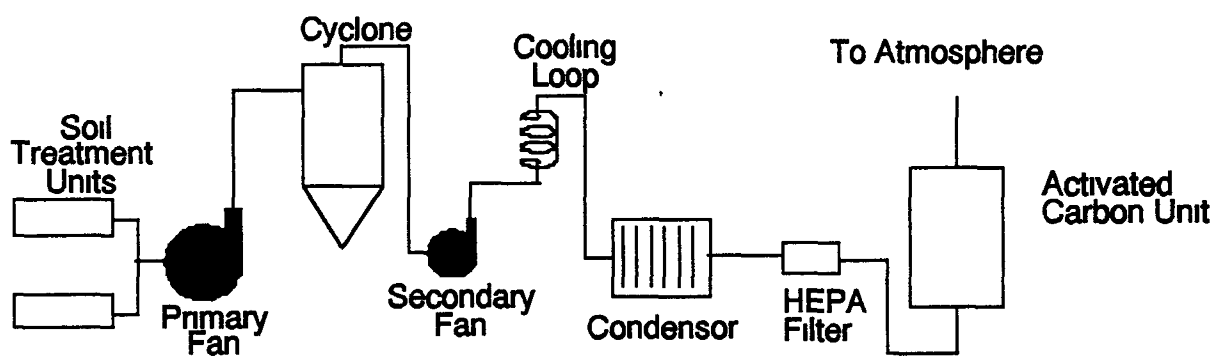
Figure 1. Process Flow Sheet

NOTE This figure represents a typical flow diagram for a thermal desorber, actual unit may vary from the one shown



A.2.2.2 Waste Acceptance Criteria for Thermal Desorption Unit

Criteria are established below to ensure the safety of workers and the protection of equipment during the processing of contaminated soil Debris, such as wood, scrap metal and glass may be encountered during source removal activities and will not be restricted from processing as long as the debris can be sized to fit into the desorption unit Clumps of contaminated soils will be broken up if their diameter exceeds the capacity of the unit to ensure that all internal volumes are treated In addition to the general requirements stated above, the following is a list of specific items that will be prohibited from treatment with this thermal desorption unit if encountered in material removed from IHSSs 110 and 111 1

- Items that are explosive as defined by the Department of Transportation (49 CFR 173 5, Subpart C),
- Items that are corrosive (6 CCR 1007-3, 261 22),
- Items that are reactive (6 CCR 1007-3, 261 23), and

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- Unexpected items encountered during field activities in which unresolved questions exist regarding personnel safety or the protection of equipment

A.2.2.3 Volatile Organic Compound Concentrations in Contaminated Soils

Samples have been collected from IHSSs 110 and 111 1 and analyzed for volatile organic compounds The following is a preliminary listing of the maximum concentrations detected* Only contaminants of concern for which concentrations exceed 1 ppm are included

Compound	T-3 Concentrations (µg/kg)	T-4 Concentrations (µg/kg)
1,1,1-Trichloroethane	27,000 (J)	2,300
1,1-Dichloroethene	9	1,044
1,2-Dichloroethane	14 (J)	
1,2-Dichloroethene	1 (J)	2 (J)
2-Butanone	88	63
Acetone	86,000	120,000
Benzene	33,000	0 01
Carbon tetrachloride	700,000	540 (J)
Chloroform	8,800	870 (J)
Ethylbenzene	2 (J)	870 (J)
Methylene chloride	55,000	8,200 (J)
Tetrachloroethene (PCE)	13,000,000	37,000
Toluene	7,600 (J)	670 (J)
Trichloroethene	120,000	680,000
Hexachlorobutadiene	170 (J)	
Hexachloroethane	1,100	

* Data are unvalidated
** J qualifier for organic detections indicates estimated result

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These concentrations may be indicative of average concentrations of volatile organics within IHSSs 110 and 111 1 However, higher concentrations are likely, including the probability of free product

A.2.2.4 Performance Standards

The following performance standards are being established for removal of VOCs from soils originating in IHSSs 110 and 111 1 These concentration levels were taken from *A Guide to Delisting of RCRA Waste for Superfund Remedial Responses*, EPA Office of Solid Waste and Emergency Response Directive 9347 3-09FS, September, 1990 Soils meeting these performance standards are delisted uncontaminated environmental media and may be returned to IHSSs 110 and 111 1 or used as fill elsewhere Soils that do not meet the performance standard, based on on-site testing, will be packaged and disposed of as appropriate

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Compound	Delisting Concentration (µg/kg)
1,1,1-Trichloroethane	222,900
1,1-Dichloroethene	127,000
1,2-Dichloroethane	371 7
1,2-Dichloroethene	
2-Butanone	
Acetone	517,000
Benzene	887 9
Carbon tetrachloride	1,408
Chloroform	496 8
Ethylbenzene	4,984,000
Methylene chloride	8,255,000
Tetrachloroethene (PCE)	3,430
Toluene	11,730,000
Trichloroethene (TCE)	1,146
Hexachlorobutadiene	5,139
Hexachloroethane	2,956

If results from laboratory analysis of after process samples come back as non-detections, at quantitation levels exceeding the levels established above in Section 2 2 4, then the processing goals are considered achieved Soils meeting these performance standards are uncontaminated environmental media and may be returned to IHSSs 110 and 111 1 or used as fill elsewhere, providing average radiological contamination levels do not exceed risk-based programmatic Preliminary Remediation Goals for subsurface soils Any debris treated by the thermal desorption unit would be appropriately characterized and disposed

A.2.2.5 Secondary Waste Streams

The thermal desorption process described will generate several secondary waste streams These waste streams include condenser liquids, spent HEPA filter media, and spent activated carbon The condenser liquids will consist of free-phase organic liquids and water (i e , two phases) Depending on the volume of

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recovered water, the water may be separated from the free-phase organic liquid and sent to the central treatment system, located in the 891 building, or the Operable Unit 2 field treatment unit (or a combination of the two) for subsequent treatment The other waste streams may be contaminated with low levels of organic contaminants These waste streams, including the free-phase organic liquids, will be drummed, characterized, and shipped off site for proper disposal as a hazardous waste as appropriate These waste streams are expected to be free of radiological contamination This determination will be verified after generation and before waste is sent off-site

Soil particulates recovered by the cyclone will be recombined with the treated soils Waste water from decontamination activities will also be generated at the conclusion of the soil processing task These liquids will be managed according to procedures described in the following section

A.3 CLOSURE

This section addresses appropriate Temporary Unit closure requirements for the closure of the roll-off containers and thermal desorption treatment unit Following the completion of contaminated soil processing, the following materials will be removed from the thermal desorption unit

- Soil,
- Organic condensate,
- Granulated activated carbon,
- Used HEPA filters

Recovered organic contaminants (organic condensate), granulated activated carbon and the used HEPA filters will all be characterized for proper disposal Soil removed from the thermal desorption unit will be temporarily placed into previously decontaminated roll-off containers and/or placed on tarps or other liner material and covered, waiting for the results of confirmation samples to evaluate the attainment of the performance standards listed in Section 2 2 4 Following evaluation, the processed, clean soils will be returned to the former trench site The thermal desorption unit and roll-off containers will then be decontaminated according to the following procedure *4-SO-ENV-OPS-FO 04, Decontamination of Equipment at Decontamination Facilities* It is expected that this large scale decontamination will take place at the site's centralized decontamination facility located in the contractor's yard The thermal desorption unit is expected to be returned to the owner for subsequent use after decontamination

A.4 WASTE ANALYSIS PLAN

A task specific sampling and analysis plan will be prepared for this task Elements of the plan will include data quality objectives, number, types and locations of samples, and references to analytical and sampling procedures This plan will also include both pre- and post-process sampling activities and will be the vehicle for collecting and analyzing volatile organic data to perform a hazardous waste determination following processing This plan will be reviewed by the Colorado Department of Public Health and the Environment and the Environmental Protection Agency

The contaminants of concern for this response action are volatile organic compounds For the purposes of this action, these contaminants are CERCLA hazardous substances and hazardous waste

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constituents which are contained in an environmental media (soil) CERCLA hazardous substances are defined in Title 40 of the Code of Federal Regulations, Section 302 4 and include RCRA hazardous waste constituents (6 CCR 1007-3 Section 260 10) A hazardous waste determination will be made on the volatile organics once they are removed from the soil matrix according to 6 CCR 1007-3, Section 262 11

Since disposal at IHSSs 110 and 111 1 took place between 1964 and 1966, the original waste generation process is unknown Therefore, when organic contaminants are recovered in the TD's condenser, an evaluation to a concentration based standard, the RCRA Toxicity Characteristic Leaching Procedure (TCLP), will be performed to classify the recovered organics It is likely that once recovered and concentrated in the TD's condenser, the organics will exceed RCRA characteristic standards, and will, therefore, be sent off-site as a hazardous waste for proper treatment

A.5 WASTE MINIMIZATION

Contaminated soil processed through a thermal desorption unit results in a significant reduction in waste handling and off-site disposal because of the nature of the technology Essentially, the technology uses a low temperature heat source to volatilize organic materials (without destroying them) contained in a soil matrix The volatile organics are separated from the soil as a gas and then redeposited in a condenser when the gases are subsequently cooled The chemical composition of the contaminants and the mass of contaminants are not changed during the process Following processing, the soil no longer contains the volatile organics and can be returned to the place of origin The contaminants are removed from the thermal desorbers condenser and sent off-site for treatment and disposal as a hazardous waste The volume of waste sent for off-site treatment is, therefore, significantly reduced over sending all contaminated soil off-site for treatment and disposal

A.6 AIR EMISSIONS

As a result of the volatile organic compounds that will be processed during this task, an Air Pollution Emissions Notice (APENS) may be prepared for review by the Colorado Air Quality Control Commission as required

A.7 TRAINING

All excavation, monitoring and processing will be performed under a task specific health and safety plan (HSP) in accordance with Occupation Safety and Health standards in 29 CFR 1910 120, Hazardous Waste Operations and Emergency Response All task specific training requirements will be listed in the HSP and will be followed

A.8 CONTINGENCY PLAN

Generally, Part VI of the Rocky Flats Part B permit will be followed for contingency planning purposes However, because of the limited nature of this task, preparation of separate contingency planning documents such as an evacuation plan will be covered by the task specific health and safety plan The task specific health and safety plan will be reviewed by all personnel working within the exclusion zone boundaries at the task site

The contingency plan describes various criteria for classification of releases of hazardous waste Some volatilization of organic contaminants is expected during the removal, storage and subsequent transfer of soils to the thermal desorption processing unit This volatilization will be monitored for the duration of the project and will be considered a permitted release However, any spills of liquid hazardous waste from primary containment will invoke the entire contingency plan contained in Part VI of the RFETS Part B Permit

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DRAFT FIELD SAMPLING PLAN
FOR THE SOURCE REMOVAL AT TRENCHES T-3 AND T-4:
OPERABLE UNIT 2

September 29, 1995

Revision A
Document Control Number RF/ER-95-####.##

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DRAFT FIELD SAMPLING PLAN
FOR THE SOURCE REMOVAL AT TRENCHES T-3 AND T-4.
OPERABLE UNIT 2

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ACRONYMS

CLP	Control Lab Program
GC	Gas Chromatograph
IHSS	Individual Hazardous Substance Site
MCLs	Maximum Concentration Levels
OU	Operable Unit
PCE	Tetrachloroethene
PPRGs	Programmatic Preliminary Remediation Goals
QA	Quality Assurance
QC	Quality Control
RFEDS	Rocky Flats Environmental Database System
RFETS	Rocky Flats Environmental Technology Site
TCE	Trichloroethene
VOA	Volatile Organic Analysis
VOCs	Volatile Organic Compounds

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FIELD SAMPLING PLAN
FOR THE
SOURCE REMOVAL AT T-3 AND T-4

1.0 INTRODUCTION

This Field Sampling Plan supports the Source Removal at Trenches T-3 and T-4 of Operable Unit (OU) 2, at the Rocky Flats Environmental Technology Site (RFETS), which are potentially contributing to the degradation of groundwater in the area This source removal project is described in the Proposed Action Memorandum for the Source Removal at Trenches T-3 and T-4 Operable Unit 2, including details on project scope, contamination levels, and regulatory concerns Information presented in this Field Sampling Plan is intended to be brief and provide the information necessary to understand the sampling approach for the project

Based on historical aerial photographs and records, Trench T-3, also known as Individual Hazardous Substance Site (IHSS) 110, is approximately 134 feet long, 20 feet wide, and 10 feet deep The trench was used from approximately October 1964 through April 1966 Trench T-4, also known as IHSS 111 1, is approximately 125 feet long, 20 feet wide, and 10 feet deep The trench was used from approximately April 1966 through April 1967 Both trenches were used to dispose of sanitary sewage sludge contaminated with uranium and plutonium Flattened empty drums also contaminated with uranium and plutonium were disposed in the trenches Although the radiation content of the sewage sludge disposed in the East Trenches reportedly ranged from 382 picoCuries per gram (pCi/g) to 3,950 pCi/g, there are no reports of metallic nuclear materials deliberately buried in the trenches Furthermore, characterization soil samples indicate the radionuclide concentrations are well below the programmatic preliminary remediation goals (PPRGs) and do not represent a concern for this project

Groundwater samples were taken from wells up-gradient (24393, 25093, and 3091) and down-gradient (24193, 24993, and 3687) from the trenches The results of these samples are summarized in Table 1 and indicate a definite increase in volatile organic compounds (VOCs) in the groundwater after passing through the trench Radionuclide contamination was not detected at elevated levels in the groundwater samples

The proposed action entails excavating volatile organic contaminated soil and material from Trenches T-3 and T-4 and processing the excavated material to remove the VOCs using thermal desorption The project will be a source removal within the dimensions of the trenches, eliminating the contamination within the trenches and preventing further degradation of the surrounding soils and groundwater The trench boundaries will be staked prior to excavation, and only the material within the trench boundaries will be excavated If visible staining remains after excavating the boundaries of the trenches, further excavation to remove the stains will be done Following verification that the thermal desorption has removed the VOC contamination, the trenches will be backfilled with treated soils and the area will be revegetated to return the trenches to a comparable undisturbed condition

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TABLE 1
T-3 AND T-4 GROUNDWATER SAMPLING RESULTS SUMMARY

	Maximum Concentrations (µg/l)						
	Up-gradient Wells			Down-gradient Wells			Federal
Contaminant	24393	25093	3091	24193	24993	3687	MCLs
Carbon tetrachloride (CCl_4)	2600	1500	450	5200	4100	1600	5
Tetrachloroethene (PCE)	1600	780	39	1600	1600	1100	5
Trichloroethene (TCE)	91	64	51	110	110	120,000	5
Toluene	20	10	8	40	30	3100	1000
Total Xylenes	30	15	<detection limit of 5	60	45	1200	10,000

2.0 SAMPLING AND DATA QUALITY OBJECTIVES

The purpose of this sampling effort is to document the conditions remaining in the trenches for a future RFETS Site-wide Risk Assessment, and to supply data for evaluating any future impacts on groundwater from the remaining soils in the trenches

After excavation, samples will be collected along the base and sides of the trenches and analyzed using field screening techniques for the contaminants of concern to establish the post-action condition of the trenches Following processing through the thermal desorption unit, each roll-off container filled with treated soils will be sampled and tested using field screening for volatile organic compounds to verify compliance with Programmatic Preliminary Remediation Goals (PPRGs) in the treated soils Since the existing characterization data indicates that metals and radiological contaminants are not a concern in the trenches, no further soil sampling will be done for those contaminants Both sampling efforts will be conducted according to the *Rocky Flats Plant Environmental Management Site-wide Quality Assurance Project Plan*

Data quality for both the excavation boundary sampling and the post-process soil sampling will be sufficient to calculate residual risks posed by the soils left in place and to determine that contaminant levels in treated soils are below PPRGs prior to replacing the soils in the excavation

An on-site field gas chromatograph (GC) is proposed for all sample analysis The field GC shall use approved EPA methodology including acceptable calibration protocols and traceable standards (reference GT 19) Ten percent of all samples will be duplicated for quality control The quality control splits will be sent to a fixed site laboratory for confirmation analysis

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3.0 SAMPLE COLLECTION AND ANALYSIS

Two types of sampling will be conducted for the project, excavation boundary sampling and post-process soil sampling Both types of samples will be analyzed using a field gas chromatograph The sampling scheme for each type of sample is described in the following sections

3.1 Excavation Boundary Sampling

In order to determine the number of samples required in each trench, the suggested guidelines from *Soil Sampling Quality Assurance User's Guide* published by the U S Environmental Protection Agency were used The number of samples required in each trench is 30 Fourteen samples shall be collected from locations approximately equally spaced along the bottom of the trenches One sample shall be collected at locations approximately mid-depth and mid-length along each end of the excavation Seven samples shall be collected from locations approximately equally spaced and at mid-depth positions along the sides of each trench The locations of these samples are shown in Figure 1 Additionally, quality control (QC) samples shall be collected including one duplicate sample and one rinsate (liquid) sample One trip blank will be shipped with samples for volatile analysis A field blank will be prepared and analyzed for the same chemicals of concern as the original samples The field blank will determine whether original samples may have been cross-contaminated by ambient conditions in the field Table 3 1 shows the sampling scheme for each trench documenting the undisturbed boundaries of the excavation

Because of the hazards associated with entry into steep-sided, unsupported excavations, field personnel shall not enter the excavation Each sample shall be collected from the excavation by means of a backhoe The backhoe bucket shall be decontaminated immediately prior to each sampling event to prevent cross-contamination of samples The excavated soil contained in the backhoe bucket shall be elevated from inside the trench to the ground surface Sufficient quantities of soil shall be transferred from the bucket to adequately fill the sample containers using a stainless steel spatula Soils for volatile analysis will be collected directly into the sampling jar to minimize loss of VOCs Samples will be collected from soils that are not directly adjacent to the backhoe blade

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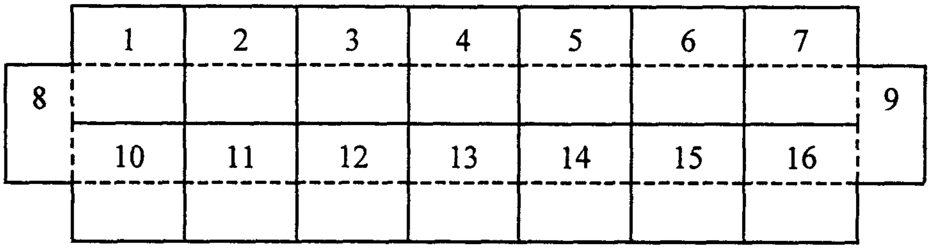

This diagram represents a trench with the walls laid flat. The dashed lines represent the bottom of the trench. The area outside of the dashed line represents the walls of the trench. The numbered boxes represent sampling grids. Grid numbers 8 and 9 are partial grids for the end walls of the trench. Each sample will be taken from a randomly determined quadrant within each grid.

Figure 1.1. T-3 and T-4 Sampling Scheme.

TABLE 3.1. Excavation Boundary Sampling

Soils Analysis per Trench				
Analysis Method	Excavation Samples	QC Samples	Total Samples	Container, Preservative, and Holding Time
Volatiles/Field GC Total VOA	16	2 duplicates	18	4 oz. glass w/ Teflon liner at 4°C for 7 days
		2 field blanks	2	4 oz. glass w/ Teflon liner at 4°C for 7 days

3.2 Post-process Soil Sampling

Following processing of the soils through the thermal desorption unit, the soil will be collected in roll-off containers. Each roll-off container will be considered a batch of treated soil. One grab sample will be collected per batch, as described in Table 3.2. These samples will be collected to document treatment completeness. Process samples will be analyzed by an on-site gas chromatograph (GC). One in ten samples will be

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collected laboratory analysis for quality control purposes Each sample will be a five point composite, taken from the four corners and center of the roll-off container

TABLE 3.2. Post-process Soil Sampling

Analyte/Method	Pre-process Samples	QA Samples	Containers, Preservative, and Holding Time
Volatiles/Field GC Total VOA	1 per batch	1 duplicate per 10 batches	4 oz glass with Teflon liner at 4°C for 7 days
		1 field blank per 10 batches	4 oz glass w/ Teflon liner at 4°C for 7 days

4.0 SAMPLE DESIGNATION

The site standard sample numbering system will be utilized for this project Each sample will be assigned a unique nine digit number The first two digits will be either a TR (trench) for the excavation boundary samples, or a PV (process verification) for the post-process soil samples The next five digits in the sample number will be sequential numbers representing the individual samples The last two digits of the sample number will be RM, representing the company performing the sampling

5.0 SAMPLING EQUIPMENT AND PROCEDURES

All sampling efforts will comply with applicable procedures from the *Rocky Flats Environmental Technology Site Environmental Documentation Management Procedure Manual*, specifically FO 15, GT 09 and 19 for field analytical methods, FO 13 for sample management, and GT 02, 07, and 08 for soil sampling

Data will be managed according to the customary procedures which include FO 14, *Field Data Management*, and 3-21000-ADM-17 01 *Quality Assurance Records Requirements* These procedures will ensure that data is collected, entered, and stored in a secure, controlled, and retrievable environment After entry into the interim database, Datacap, the data will be uploaded to the Rocky Flats Environmental Database System (RFEDS) database

5.1 Sample Handling and Procedures

The field gas chromatograph sample analyses will comply with the procedure described in the *Rocky Flats Environmental Technology Site Environmental Documentation Management Procedure Manual*, GT 19 Sample labeling, handling,

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and shipping shall be performed in accordance with FO 13, *Containerization, Preserving, Handling, and Shipping of Soil and Water Samples*

All QC samples sent to the laboratory will be analyzed according to the U S Environmental Protection Agency's (EPA) Contract Lab Program (CLP) standards The CLP type analysis is outlined in the July 2, 1991 revision of the *EG&G Rocky Flats, General Radiochemistry and Routine Analytical Service Protocol, version 3 0, 1994* Sample labeling, handling, and shipping shall be performed in accordance with FO 13, *Containerization, Preserving, Handling, and Shipping of Soil and Water Samples*

5.2 Documentation

Field instrument data sheets, field logbooks, and sample collection forms shall include the following information for each data or sample point

- Field sample identification,
- Date and time of sampling or measurement,
- Sample location,
- Sample description,
- Sample depth (if appropriate),
- Parameters or analyses being reported,
- Associated QA/AC samples,
- Field measurements made by field instruments,
- Equipment model and serial numbers with latest calibration date where applicable, and
- Background readings and measurement units

Soil sample information shall be recorded on form FO 14G, "Pit and Trench Form " The data shall be entered into Datacap These forms shall be reviewed by the Project Manager prior to data entry A hardcopy of the manually entered data will be initialed and dated by the Project Manager and the Data Manager Data shall be checked for transcription errors, accuracy, and to ensure that all samples that were intended to be collected were collected, shipped and entered into datacap

Changes or corrections may be required in the data stored in Datacap All changes must be accompanied by a data correction/change form The form shall detail the changes to be made and document that the changes were completed Corrections to the database shall be reviewed by the Data Manager or designee for potential entry errors

The following actions are designed to ensure the final data submitted to RFEDS is complete, correct, and consistent with procedure FO 14 *Field Data Management*

- A hard copy of the data organized by location shall be verified by the Data Manager or designee
- All corrections to the hard copy shall be made in red ink
- Using the data entry sheets and sample collection sheets, the information shall be checked to assure that data identifications are correctly listed on the hardcopy, and the number of samples collected and shipped is correct
- Check that all the parameters requested for each analysis are reported on the hardcopy, and that units reported on the hardcopy are correct
- Check values for all manually collected parameters reported from the database against the field collection forms
- The data shall be reviewed by a scientist familiar with the project objectives and data collection activity to disposition data containing gross errors
- Check the corrected copy of the database to determine that corrections have been implemented

6.0 PROJECT ORGANIZATION

The Project Manager is responsible for ensuring that all data are collected, verified, transmitted and stored in a manner consistent with relevant operating procedures The Project Manager, or his designee, will obtain from the RFEDS User System Manager sample numbers and location codes The User System Manager will verify any transmitted record for accuracy and completeness and ensure the data is preserved, retrievable, and traceable

The sample crew personnel will be responsible for field data collection Their data management tasks will include completing all appropriate data management forms and completing the Chain-of-Custody form The sample crew shall deliver field GC samples with chains-of custody to the field GC The field GC shall sign for receipt of the samples For the QC samples being sent to the laboratory for analysis, the sample crew delivers forms and Chain-of-Custodies to the Data Manager

The Sample Manager/Data Manager is responsible for verifying that the Chain-of-Custodies are complete and accurate before the samples are shipped to the laboratory The sample manager obtains the preliminary Radiological screen from the on-site lab for release of the samples off-site The Data Manager's duties include data entry into Datacap, and transmitting field information, sample collection data, and Chain-of-Custody tracking data to RFEDS All QA records shall be submitted from the Data Manager to the Project Manager, and ultimately to the Environmental Restoration (ER) Records Center via the Project Manager

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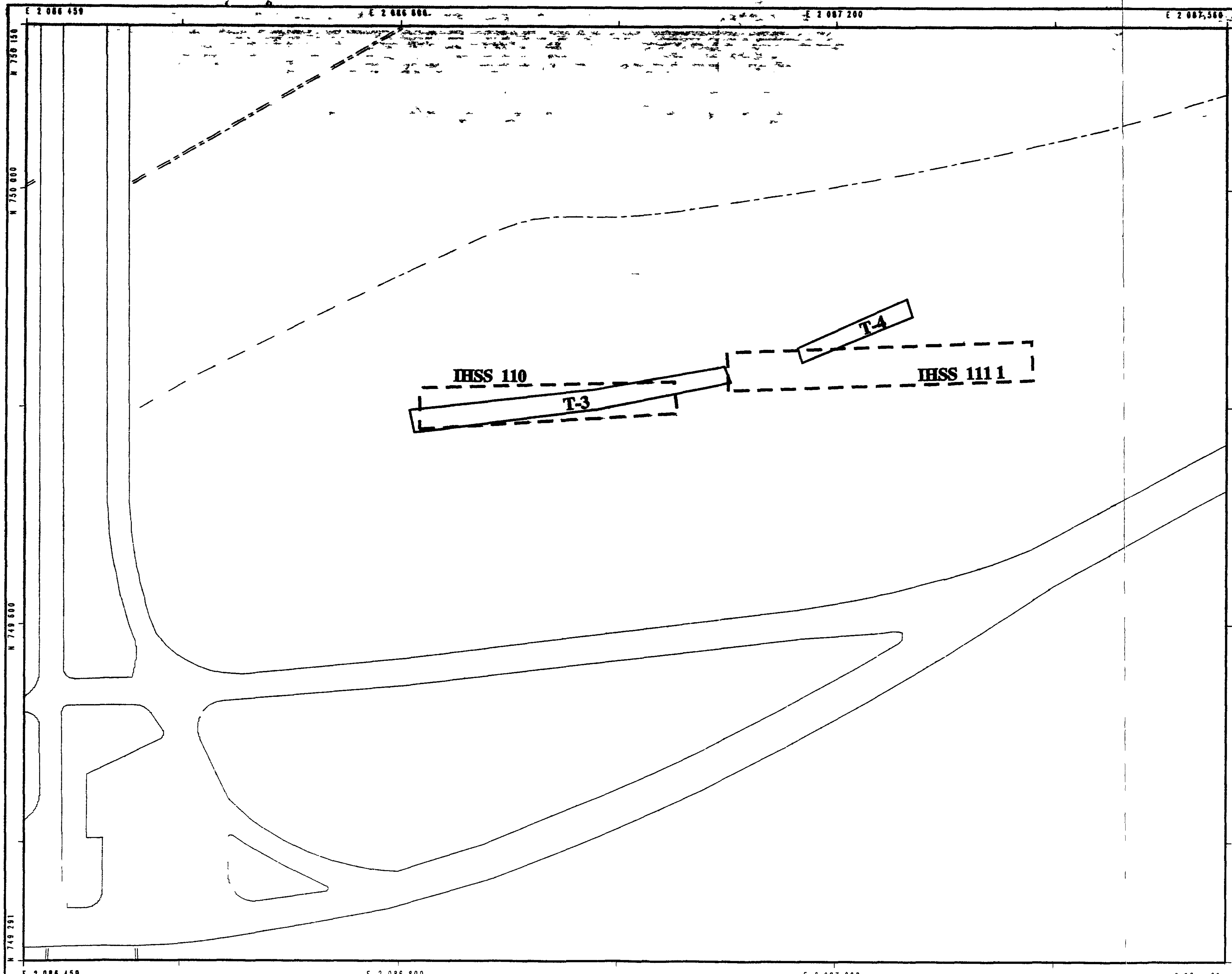

FIGURE 2.1
Location of Trenches T-3 and T-4

Standard Map Features

- IHSS Boundary
- Trench Boundary
- Dirt roads
- Paved roads
- Streams, ditches, or other drainage features

DATA SOURCE:
Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. 1991.
Hydrology provided by USGS (date unknown)

Scale 1:1050
Inch represents approximately 87 feet

45 0 90ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U S Departm t of En gy
Rocky Flats Envi onmental Technology Site

Prepared by

RMRS Rocky Mountain Remediation Services, L.L.C.
Geographic Information Systems Group
Rocky Flats Environmental Technology Site
Box 464
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MAP ID: new-trench September 29, 995

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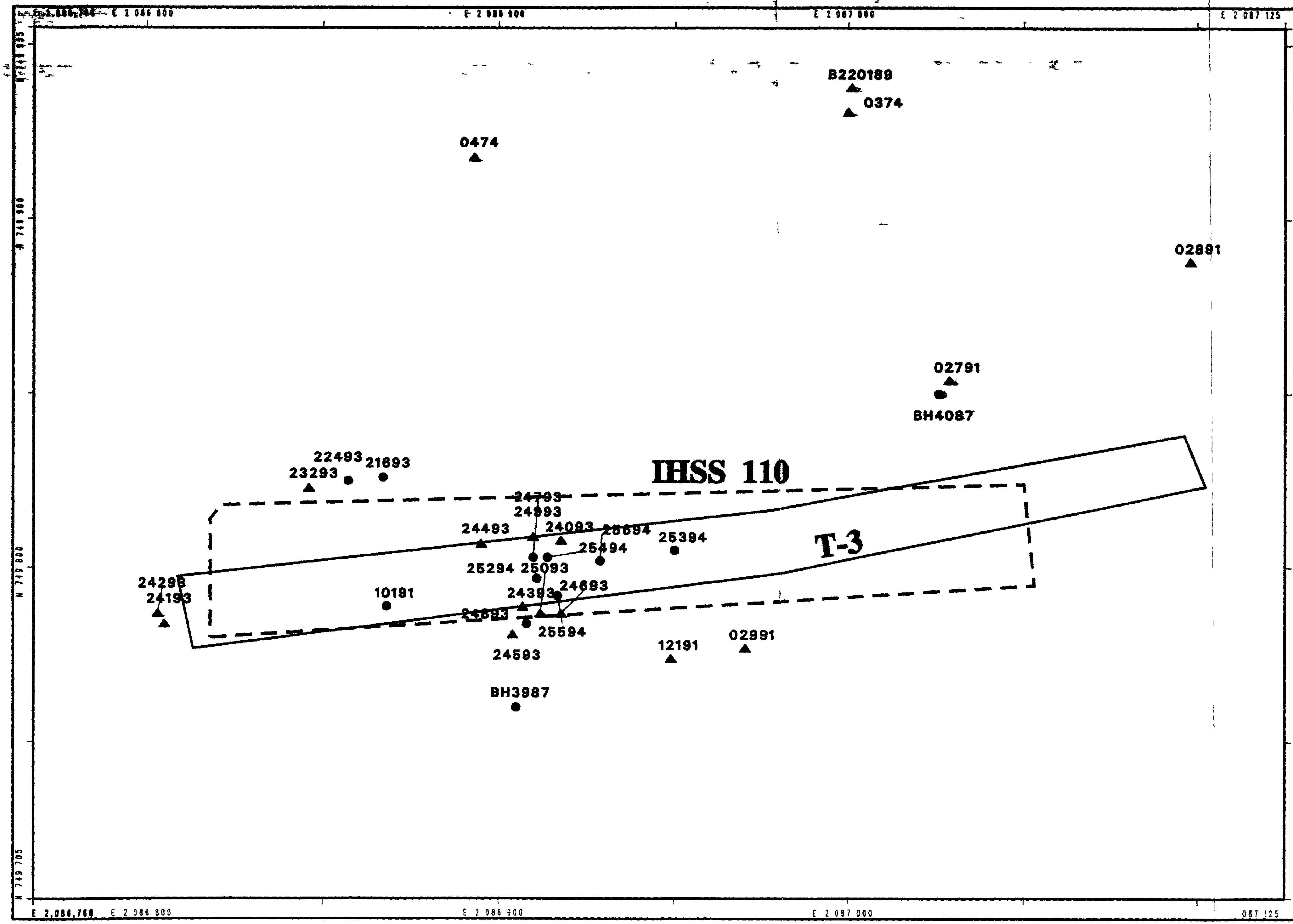

FIGURE 2.3.1
Location of T-3 Boreholes and Wells

Sampling Types

- Borehole
- Groundwater Well

Standard Map Features

- IHSS Boundary
- Trench Boundary
- Dirt roads
- Paved roads

Scale 1:350
1 inch represents approximately 29.6 feet

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U S Department of Energy
Rocky Flats Environmental Technology Site

Prepared by:
RMRS Rocky Mountain Remediation Services, L.L.C.

MAP ID: new-trench
September 29, 1995

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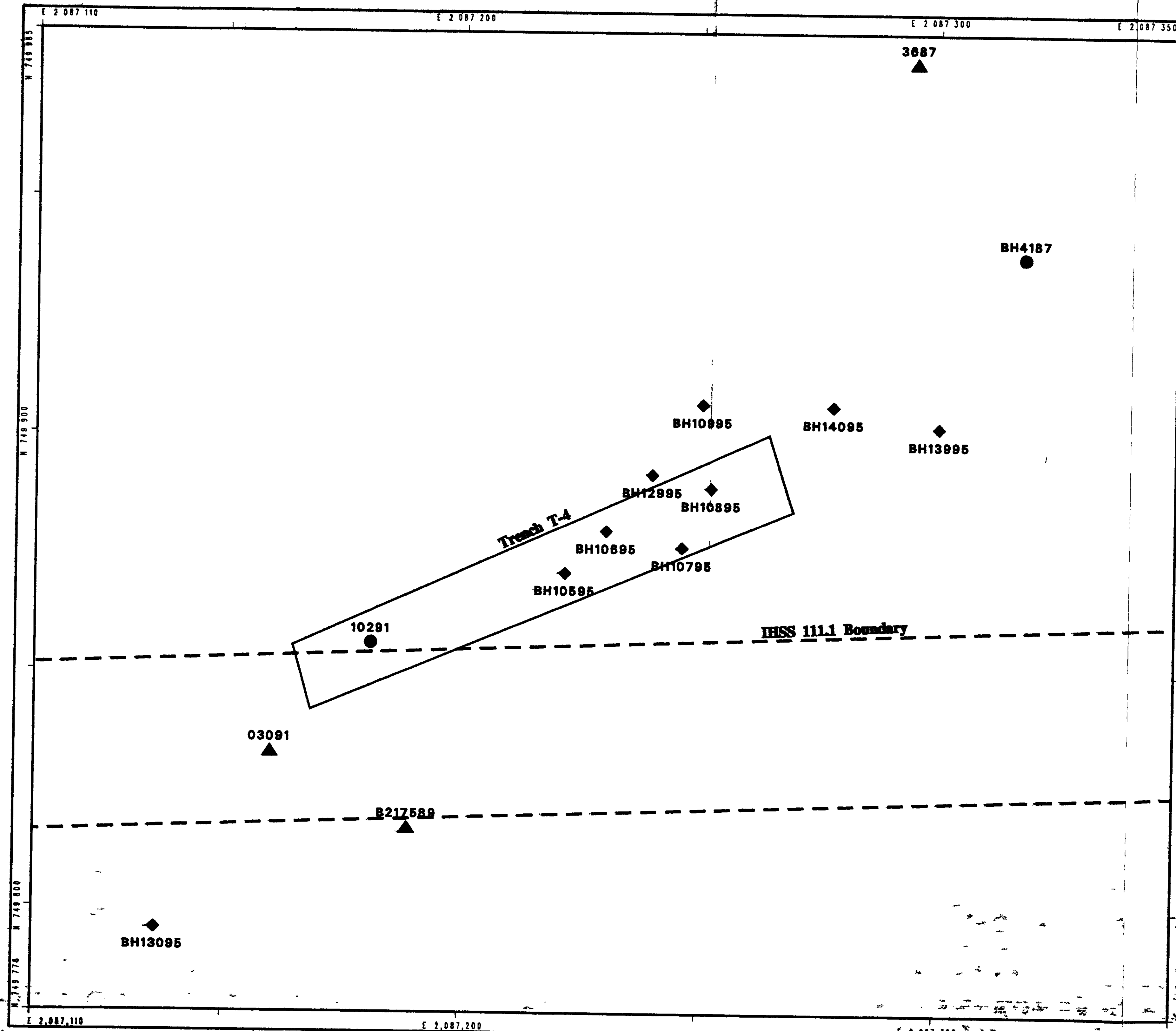

Figure 2.3.2
Location of T-4 Boreholes and Wells

Sampling Types

- Borehole
- Groundwater Well
- Characterization Borehole
- IHSS Boundary
- Trench Boundary

DATA SOURCE:
Buildings, roads, and fences provided by Facilities Engr., EG&G Rocky Flats, Inc. 1991.
Hydrology provided by USGS (date unknown)
Electromagnetic data provided by Woodward-Clyde; June, 1995.
Characterization Boreholes provided by Woodward Clyde; May 1995.

Scale 1 : 250
1 inch represents approximately 20.83 feet

10 0 20ft

State Plane Coordinate Projection
Colorado Central Zone
Datum: NAD27

U.S. Department of Energy
Rocky Flats Environmental Technology Site

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MAP ID: ers-trench September 27, 1995